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Eastern Creek Quarter, Stage 3

Noise Impact Assessment

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1 INTRODUCTION

This Noise Impact Assessment has been prepared for Frasers Property Australia to support a State Significant Development Application (SSDA) submitted to the Department of Planning, Industry and Environment (DPIE) relating to Lot 3 of the Eastern Creek Quarter Site at Rooty Hill Road South, Eastern Creek. The application seeks Concept Plan approval for the staged construction of a new retail outlet centre at Lot 3 with supporting food and beverage tenancies, and ancillary entertainment and recreation usages.

This report addresses the following items of the Secretary's Environmental Assessment Requirements (SEARs) for SSD10547:

- Amenity
- Noise and Vibration

The noise sources investigated to address the above requirements are as follows:

- Environmental noise impact on the future site, including surrounding traffic noise from surrounding roadways.
- Noise emissions from use of the site including, including carparking, loading docks & mechanical plant noise to surrounding receivers.
- A preliminary review of potential noise and vibration impacts as a result of construction impacts.

The assessments and recommendations detailed in this report have been based on the architectural plans prepared by i2C Architects.

2 SITE DESCRIPTION & PROPOSED WORKS

2.1 THE SITE

The 34ha Eastern Creek Quarter site is situated to the north of the Great Western Highway between Rooty Hill Road South and the M7 Motorway. Church Street marks the site's northern boundary. The site forms part of the Western Sydney Parklands and is located within the Blacktown Local Government Area. It is located approximately 1.5km south east of Rooty Hill Station.

This SSDA relates to Lot 3 of the ECQ site, which is the final lot proposed to be developed. It is located in the northern part of the site and has an area of approximately 7.29ha (refer Figure 1).

2.2 PROPOSED WORKS

The proposed State Significant Development Application (SSDA) seeks Concept Plan approval for a new retail outlet centre at Lot 3 of the Eastern Creek Quarter site. The Concept Plan will establish the following framework to guide the future detailed design of the Lot 3 development:

- Land uses, including retail (factory outlet), food and drink premises, amusement centre and indoor recreation facility;
- Building footprints, including basement, with a maximum height of 12m;
- A maximum GFA of 39,500m^2 at Lot 3 which will be staged as follows:
  - Phase A: 29,500m^2
  - Phase B: 10,000m^2
- Upgrade of Church Street for vehicular access, including traffic signals at the Church Street/Rooty Hill Road South intersection;
- Modifications to the Cable Place/Rooty Hill Road South/Site Access intersection; and
- Modifications to the Francis Street/Eastern Road/Rooty Hill Road South intersection.

There are two loading facilities and access points for retail vehicles, with one proposed on each side of the development. The stage 3A loading docks are located on the southern boundary of the site with access off of Beggs Road and at the western boundary of the carpark accessed from Church Street. Stage 3B will retain the Beggs street loading dock and replace the western loading dock with one on the north eastern portion. Figure 2 details the locations of the loading docks for the site. For the purposes of assessment, reference will primarily be made to the Stage 3A loading docks, given they are closer to future residents.

General operating hours for the retail centre (inclusive of loading activities) will be 7am – 10pm.

It is also proposed to seek consent for a series of early works including:

- Removal of up to 0.73 ha of Cumberland Plains Woodlands in the south west corner of the site;
- Bulk earthworks within Lot 3; and
- Extension of the internal access road to connect to the basement car park.

The proposed outlet centre at Lot 3 will necessitate the inclusion of conditions of consent which requires the modification of SSD 5175 (the existing Concept Plan for the broader ECQ site) to amend the overall allocation of GFA and associated uses, relevant Concept Plans and the existing Design Guidelines.

2.3 ACOUSTIC ENVIRONMENT & SURROUNDING RECEIVERS

Noise sensitive receivers are generally located west of the proposed development across Rooty Hill Road. Residential dwellings at this location are typically single storey, however a limited number of two storey dwellings have also been constructed. There is a single residential dwelling located on the corner of Beggs Road and Rooty Hill Road South, on the boundary of Eastern Creek Quarter Stage 1 works. We note that there is a 2.5m high acoustic screen constructed on the eastern boundary of this property, which faces the proposed Beggs Street loading dock.

Noise levels in the vicinity of the site are generally dominated by traffic noise impacts from Rooty Hill Road South.

Refer to Figures 1 & 2 for detailed project siting, layouts and noise receiver locations.

Figure 1 – Site & Measurement Location

Figure 2 – Eastern Creek Quarter Masterplan (Extent of Stage 3 Outlined)

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{Max}, L_{90} and L_{eq}.

The L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

L_{Max} levels represent is the loudest noise event during a measurement period.

4 SURVEY OF EXISTING NOISE CONDITIONS

4.1 SURVEY OF AMBIENT NOISE

Both long term unattended noise monitoring and attended noise measurements were conducted to quantify the existing acoustic environmental at the site.

Unattended noise monitoring was conducted over an eleven-day period between 17th to the 27th July, 2020 using Acoustic Research Laboratories monitors set on A-weighted fast response mode. The monitor was calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded. Weather affected data has been excluded in line with the requirements of Factsheets A & B of the NSW EPA Noise Policy for Industry. Noise monitoring data is presented in Appendix One.

One monitor was installed on the site across from the closest residential receivers. The monitor was installed with a similar setback from the roadway as the adjacent residents. This monitoring location was selected as it was both secure for monitoring equipment and would provide background noise data representative of the nearest noise receivers.

4.1.1 Measured Noise Levels

Measured noise levels are presented in Table 1 below.

Table 1 – Long Term Noise Logging Data (L_{eq} and Rating Background Noise Levels)

Location	Measured Noise Level - Time of Day		
	Daytime (7am-6pm)	**Evening (6pm-10pm)**	**Night (10pm-7am)**
Eastern Creek Retail, Stage 1	60 dB(A)$L_{eq(Period)}$ 49 dB(A)L_{90}	59 dB(A)$L_{eq(Period)}$ 49 dB(A)L_{90}	57 dB(A)$L_{eq(Period)}$ 45 dB(A)L_{90}

5 NOISE EMISSION CRITERIA

5.1 DEVELOPMENT CONSENT FOR SSD 8588

There is no specific criteria relating to noise emissions from the loading dock area of the development, however reference is made throughout to the NSW EPA *Industrial Noise Policy* (B20, F18). We note that this policy has been superseded by the NSW EPA *Noise Policy for* Industry (2017), and this assessment will be based on the requirements of the updated policy.

5.2 NSW EPA NOISE POLICY FOR INDUSTRY (NPI) 2017

The EPA NPI has two criteria which are both required to be satisfied, namely Intrusiveness and amenity. The NPI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the suburban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Table 1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

5.2.2 Project Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Table 1, the Noise Policy for Industry suggests the adoption of the 'suburban' categorisation.

The NPI requires project amenity noise levels to be calculated in the following manner;

$$L_{Aeq,15min} = \textit{Recommended Amenity Noise Level} - 5\ dB(A) + 3\ dB(A)$$

The amenity levels appropriate for the receivers surrounding the project site are presented in Table 2

Table 2 – EPA NPI Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15min)}$
Residential – Suburban	Day	55	53
	Evening	45	43
	Night	40	38
Commercial Premises	When in use	65	63
Industrial Premises	When in use	70	68

The NSW EPA Noise Policy for Industry (2017) defines;

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

5.2.3 Sleep Arousal Criteria

The Noise Policy for Industry recommends the following noise limits to mitigate sleeping disturbance:

Where the subject development / premises night -time noise levels at a residential location exceed:

- *$L_{eq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{Fmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

a detailed maximum noise level even assessment should be undertaken.

The following sleep emergence noise objectives then apply.

Table 3 - Sleep Arousal Criteria for Residential Receivers

Receiver	Day / Time Period	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Residential Dwellings Surrounding Site	Night Time (10pm – 7am)	45	60 dB(A) $L_{eq,\ 15min}$; 70 dB(A) L_{Fmax}

If there are noise events that could exceed the emergence levels detailed in the table above, then an assessment of sleep arousal impact is required to be carried out, taking into account the level and frequency of noise events during the night, existing noise sources, etc. This more detailed sleep arousal test is conducted using the guidelines in the EPA *Road Noise Policy*. Most relevantly, the *Road Noise Policy* states:

For the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
- *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

5.2.4 Summarised NPI Noise Emission Criteria

Table 4 – EPA NPI Project Noise Target Level (PNTL) (Residents Surrounding)

Receiver	Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) $L_{eq(15min)}$	Intrusiveness Criteria dB(A) $L_{eq(15min)}$	NPfI Criteria for Sleep Disturbance
Residential	Day	49	**53**	55	N/A
	Evening	49	**43**	51	N/A
	Night	45	**38**	50	50 dB(A) $L_{eq, 15min}$; 60 dB(A) L_{Fmax}
Commercial Premises	When in Use	-	**63**	-	-

6 NOISE EMISSION ASSESSMENT

The *Noise Policy for Industry* requires that noise levels are assessed at the closest façade of a habitable space, e.g. a bedroom or living area. Predicted noise levels will be presented for the evening period, which is considered to be the most sensitive time of use. The assessment will cover average ($L_{eq(15min)}$) noise events – intermittent/peak noise events are required to be assessed during the night time period, during which loading dock activities are not proposed.

The analysis presented in this section of the report has been based on drawings issued by i2C Architects (refer Figure 2) and estimated usage of the site. Noise emissions will be assessed with reference to the daytime and evening criteria outlined in Section 5.2.4, as this is considered to be the most sensitive time of use.

6.1 ASSESSMENT OF LOADING DOCK ACTIVITIES

It is proposed that the loading dock is to operate between 7am – 10pm 7 days per week. Operational noise from proposed use of the loading dock must comply with the requirements of the EPA *Noise Policy for Industry*, the criteria for which has been detailed in Section 5.2.4. As surrounding receivers will be screened by activities at the rear of the development, the primary source of noise expected to be emitted through the use of the loading dock will be from truck movements entering/exiting the facility. Loading dock access to the site is from the north eastern portion of the site, with the access route for all heavy vehicles to the loading dock to the rear of the bulky goods tenancies.

At this stage, the precise operational/delivery requirements for individual tenancies is not yet known, however indicative loading dock use has been assessed by *Colston Budd Rogers & Kafes Pty Ltd* traffic engineers for the project, assumed to be the peak usage required for the loading dock over a one hour period:

- 1 semi-trailer
- 2 rigid trucks
- 3 vans

It has been assumed that each of the loading docks are operating simultaneously with the above usage, for a given one hour period.

6.1.1 Acoustic Data

Operational noise emissions are predicted to the closest residential receivers based on the noise levels detailed in Table 5

Table 5 – Average (L_{eq}) Noise Levels Associated with Loading Dock Operation

Noise Source	Sound Power Level
Articulated Delivery Truck (Semi Trailer or Similar) Slowly Manoeuvring	108 dB(A) L_{eq}
Rigid Delivery Trucks (Heavy Rigid) Travelling at 10 km/h	100 dB(A) L_{eq}
Car / Van Travelling at 10 km/h	84 dB(A) L_{eq}

Noise levels detailed in the above tables have been previously measured by this office from similar studies.

6.1.2 Predicted Noise Levels from Loading Dock at Most Affected Receivers

Table 6 – Predicted Average (L_{eq}) Noise Levels from Loading Dock Operation

Noise Source	Receiver	Time of Operation	Predicted Sound Level dB(A)$L_{eq(15min)}$	Criteria*	Comment
Loading Dock Operation / Delivery Vehicle Entry to Site	R1 Residence to the South	Daytime / Evening Use (7am – 10pm)	42 dB(A) $L_{eq(15min)}$	≤ 43 dB(A) $L_{eq(15min)}$ (Evening Amenity)	Meets NPI Requirements
	R2 Residence to the West		42 dB(A) $L_{eq(15min)}$		

Noise emission are predicted to achieve the $L_{eq(15min)}$ criteria set out in Section 5.2.4 during the proposed operational hours.

6.1.3 Recommended Controls for the Use of the Loading Docks

It is recommended that the following management and physical controls be implemented into the design and operation of the proposed loading dock associated with the Eastern Creek Retail, Stage 3 project:

- Bail and/or garbage compactors are to be used only within the loading dock areas.
- Neoprene rubber buffers should be installed on the vertical face of the loading dock where vehicles park to absorb impacts.
- A detailed assessment of noise emissions from plant and equipment associated with the loading dock is required to be conducted prior to installation.
- Vehicle engines should be switched off during loading and unloading within the dock.

Acoustic screening of the use of the loading zone will result from the construction of the buildings on the site and no additional acoustic screening is required to the loading zone

6.2 ASSESSMENT OF CARPARKING FACILITIES

As part of the proposed Eastern Creek Quarter, Stage 3 project, additional carparking facilities are proposed, with access from Church Street. Typically, peak usage of the carparking facilities would be expected to occur during the AM or PM peak periods of operation (7am – 9am & 4pm – 6pm). *Colston Budd Rogers & Kafes Pty Ltd* traffic engineers have provided the expected traffic flows to/from Church Street during the peak weekday and Saturday usage of the site, which would represent the most intensive usage. A summary of the vehicle movements are detailed below:

- Weekday peak – 145 exiting / 135 entering – total 280 vehicle movements
- Saturday peak – 325 exiting / 295 entering – total 620 vehicle movements

Usage of the carpark outside of these periods would be substantially less, and readily compliant with the noise emission requirements for the site.

6.2.1 Acoustic Data

Operational noise emissions are predicted to the closest residential receivers based on the noise levels detailed in Table 7 (average noise levels).

Table 7 – Average (L_{eq}) Noise Levels Associated with Carparking Activities

Noise Source	Sound Power Level
Car / Van Travelling at 10 km/h	84 dB(A) L_{eq}

Noise levels detailed in the above tables have been previously measured by this office from similar studies.

6.2.2 Predicted Noise Levels from Carparking Facilities at Most Affected Receivers

Table 8 – Predicted Average (L_{eq}) Noise Levels from Car Parking Facilities

Noise Source	Receiver	Time of Operation	Predicted Sound Level dB(A)$L_{eq(15min)}$	Criteria*	Comment
Use of Carparking Facilities	R1 Residence to the South	Daytime Peak Periods	< 40 dB(A) $L_{eq(15min)}$	≤ 53 dB(A) $L_{eq(15min)}$ (Daytime Amenity)	Meets NPI Requirements
	R2 Residence to the West		46 dB(A) $L_{eq(15min)}$		

Noise emission are predicted to achieve the $L_{eq(15min)}$ criteria set out in Section 5.2.4 during the proposed operational hours. No further controls are recommended to this area to satisfy acoustic requirements.

6.3 ASSESSMENT OF RETAIL TENANCIES & OUTDOOR DINING AREAS

The primary source of noise generated through the use of this area of the development will be patron noise from the Alfresco Deck. We note that noise from use has already been reviewed and assessed as part of the Stage 1 approval, however the additional tenancies proposed as part of Stage 3 would present an intensification of the proposed use. In this regard we note the following;

- The specific operational requirements for these spaces would need to be confirmed by the future operator.
- General retail tenancies would not be expected to generate significant levels of noise, and given the significant distance separation between the site and residential uses as well as the screening offered by the building form, noise impacts would be expected to be reasonably controllable.
- The cumulative impacts of noise from the combined operation of all retail tenancies should be considered when assessing the noise impacts from individual tenancies.
- Licensed tenancies will likely have the highest potential acoustic impact, pending their capacity and siting. Tenancies of this nature would require a noise impact assessment to be conducted to determine appropriate management controls and treatments in order to mitigate noise impacts to land uses surrounding the development. In any case, given the significant distance separation between the site and residential uses as well as the screening offered by the building form, noise impacts would be expected to be reasonably controllable.
- The cumulative impacts of noise from the combined operation of all retail tenancies should be considered when assessing the noise impacts from individual tenancies.

A preliminary/indicative assessment of noise emissions from the extended hours for the Alfresco dining area has been presented in the following section.

6.3.1 Preliminary Assessment of Noise Emissions from Outdoor Dining Operation

The most significant source of noise likely to be emitted from the proposed retail components of the site will be patron noise, especially from outdoor dining areas. In this regard, preliminary assessment of noise emissions to the nearest residential receivers from this use is presented below, noting the following assumptions;

- All food and beverage tenancies will have external seating, with varying capacities.
- Each tenancy would have approximately 30-50 external seats (pending tenancy size and overall quantity of tenancies operating). 500 patrons on the Alfresco Deck have assessed as part of this review.
- It is assumed that one in two patrons would be talking at any one time, with a sound power level for a patron talking in a raised voice is 75 dB(A) L_{eq}.

6.3.2 Predicted Noise Levels at Most Affected Receivers

The predicted noise level based on the assumptions detailed above are detailed in Table 9. In the absence of any other noise emission criteria relevant for the assessment of patron/operational noise, operation of the outdoor dining areas has been assessed against a 'background + 5 dB(A)' level which is consistent for this type of noise source.

Table 9 – Predicted Average (L_{eq}) Noise Levels from Outdoor Dining Areas

Noise Source	Receiver	Time of Operation	Predicted Sound Level dB(A)$L_{eq(15min)}$	Criteria*	Comment
Alfresco Deck (Including Outdoor Dining Area)	R1 Residence to the South	Daytime / Evening Use (7am – 10pm)	< 45 dB(A) $L_{eq(15min)}$	≤ 54 dB(A) $L_{eq(15min)}$ (Daytime/Evening BG+5 Noise Level)	Meets Noise Emission Goals
	R2 Residence to the West		< 45 dB(A) $L_{eq(15min)}$		

Noise emission are predicted to achieve the $L_{eq(15min)}$ criteria set out in Section 5.2.4 during the proposed operational hours. Notwithstanding the above, it is recommended that all proposed retail/hospitality uses within the precinct be subject to a separate development application once specific uses and operators have been determined. At this time, individual tenancies should demonstrate that noise emission requirements are able to be met, and the specific management controls/building treatments which may be implemented to ensure compliance.

7 CONSTRUCTION NOISE ASSESSMENT

An assessment of likely construction noise impacts has been undertaken. The assessment includes:

- Identification of the noise and vibration guidelines which will be applicable to this project.
- Identification of potentially impacted nearby sensitive receivers.
- Identify likely sources of noise and vibration generation and predicted noise levels at nearby development.
- Formulation of a strategy to address the guidelines identified and including mitigation treatments.

7.1 SITE DESCRIPTION

The proposed project includes the excavation of material including infill and soft sand stone and construction of the development. The expected activities can be expected to include:

1. Removal of infill material.
2. Excavation.
3. Building constructions.

Standard work hours have been assumed as detailed in the NSW EPA Interim Construction Noise Guideline:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sundays or Public Holidays: No work.

7.2 RECEIVER LOCATIONS

Sensitive receiver locations for the construction phase of the development are detailed in Section 2.

7.3 NOISE AND VIBRATION GUIDELINES

7.3.1 EPA Interim Construction Noise Guideline

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise management levels (based on ambient noise monitoring);
- Review of generated noise levels at nearby development;
- Recommendation of noise controls strategies when noise management levels are exceeded.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.

- "*Highly noise affected level*". Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

A summary of the above noise management levels from the ICNG is presented below in Table 10. In order to present a conservative assessment, the lowest daytime rating background noise level determined from monitoring has been used as a basis for calculation of the 'Noise Affected Level'.

Table 10 – Noise Management Levels

Location	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
All Residential Receivers	59	75
Commercial	65	-

If noise levels exceed the exceed the management levels identified above, reasonable and feasible noise management techniques will be reviewed.

7.3.2 Vibration

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation levels presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

7.3.2.1 Structure Borne Vibrations (Building Damage Levels)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The vibration levels presented in DIN 4150-3 (1999-02) are detailed in Table 4.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 11 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

	TYPE OF STRUCTURE	PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

The surrounding commercial/industrial buildings would be considered a Type 1 structure, whilst nearby residences would be classified as a type 2 structure.

7.3.2.2 Assessing Amenity

The NSW EPA document "*Assessing Vibration: A Technical Guideline*" provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity. Relevant vibration levels are presented below.

Table 12 – EPA Recommended Vibration Levels

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

7.4 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

For this project, the most significant sources of noise or vibration generated during construction will be excavation and building structure works. The following table presents assessment noise levels for typical construction equipment expected to be used during the construction of the proposal.

Table 13 - Sound Power Levels of the Typical Equipment

Equipment / Process	Sound Power Level dB(A)*
Concrete Pump	110
Trucks	100
Powered Hand Tools	95-100

The noise levels presented in the above table are derived from the following sources, namely:

- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

7.5 NOISE PREDICTIONS

The predicted noise levels during excavation and construction will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. The distance between the noise source and the receiver will vary depending on which end of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.

Predicted noise levels are presented in the following tables. Predictions take into account the expected noise reduction as a result of distance and the internal noise reduction where indicated.

Table 14 – Predicted Noise Generation to Residential Receivers (R1)

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Concrete Pump	51 – 72	Exceeds NAML when working close to the southern boundary
Trucks	41 – 62	Within NAML
Powered Hand Tools (Externally)	41 – 62	Within NAML

Table 15 – Predicted Noise Generation to Residential Receivers (R2)

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Concrete Pump	50 – 66	Exceeds NAML when working close to the western boundary
Trucks	40 – 56	Exceeds NAML
Powered Hand Tools (Externally)	40 – 56	Within NAML

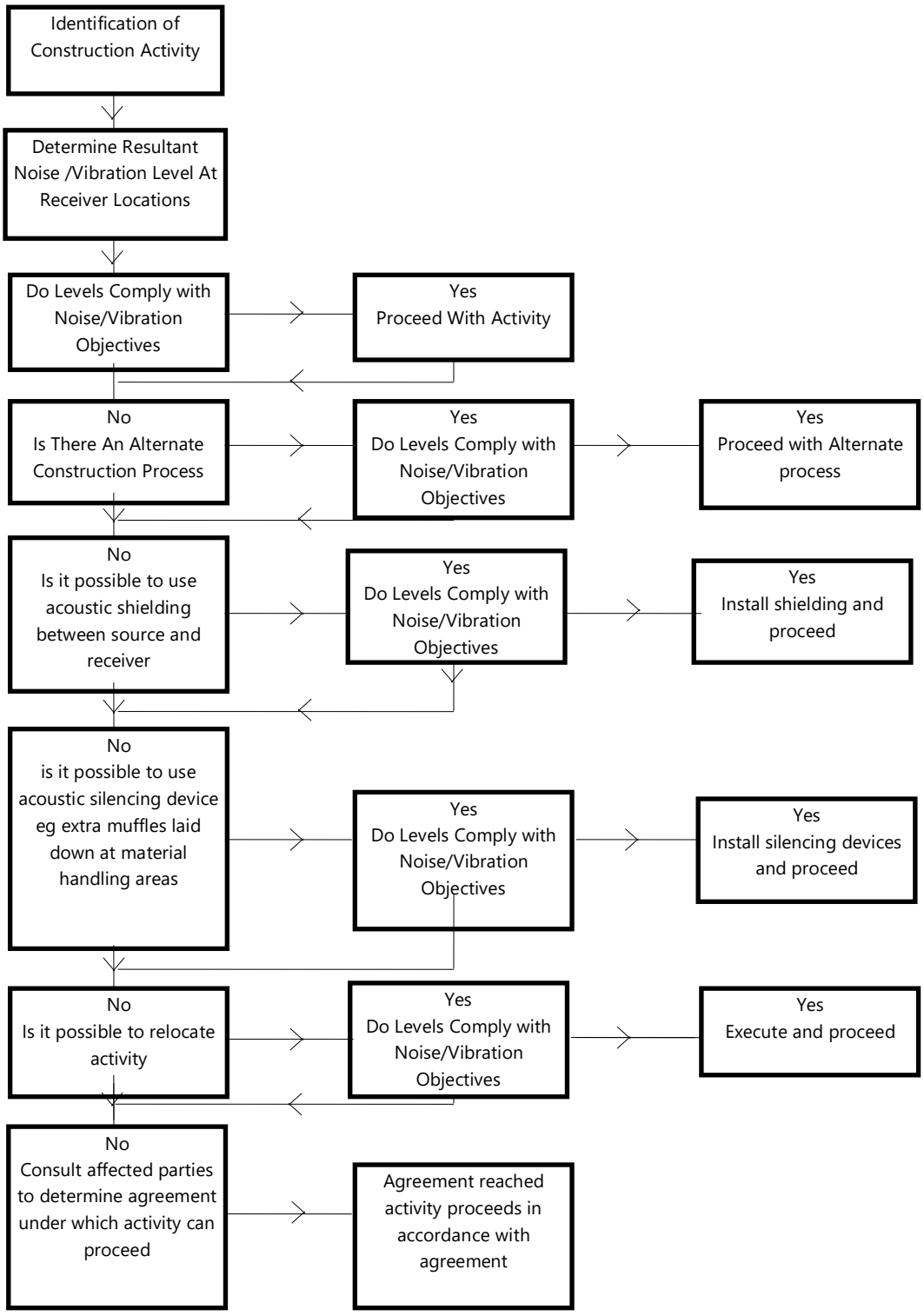
7.6 RECOMMENDATIONS

Exceedances to the 'Noise Affected Management Level' are expected when concrete pumping occurs close to the eastern site boundaries. In light of the above, the following recommendations are made:

- Where feasible for the construction process, locate any concrete pumps on the site such that the distance is maximised to surrounding noise sensitive receivers. If possible, consideration may be given to localised barriers close to concrete pumps to further minimise noise impact.
- Quiet work methods/technologies:
    - Materials handling/vehicles:
        - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
        - Avoid careless dropping of construction materials into empty trucks.
        - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Complaints handling - In the event of complaint, the procedures outlined in Sections 7.7, 7.8 and 7.9 should be adopted.
- A detailed noise management plan should be developed by the main contractor that describes in detail the construction phases, programme, processes and equipment used, noise impact assessment and proposed mitigation and management.
- Site Induction:
    - A copy of the Noise Management Plan is to be available to contractors. The location of the Noise Management Plan should be advised in any site induction.
    - Site induction should also detail the site contact is to be notified in the event of noise complaint.

7.7 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS

The flow chart presented below illustrates the process that will be followed in assessing construction activities.



7.8 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered.

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

7.8.1 Selection of Alternate Appliance or Process

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels. This measure has the potential to reduce noise emissions by 10 dB(A) or more.

7.8.2 Acoustic Barriers

Given the position of adjacent development, it is unlikely that noise screens will provide significant acoustic benefit for commercial or residential receivers but will provide noticeable improvement for those on ground level.

The placement of barriers at the source is generally only effective for static plant. Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

7.8.3 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

7.8.4 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

7.8.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. A more detailed management plan will be developed for this project in accordance to the construction methodology outlining work procedures and methods for minimising noise.

7.8.6 Combination of Methods

In some cases, it may be necessary that two or more control measures be implemented to minimise noise.

7.9 ADDRESSING COMPLAINTS

Should ongoing complaints of excessive noise or vibration levels occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

8 CONCLUSION

This report provides the results of the Noise Impact Assessment for the proposed Eastern Creek Retail Centre, Stage 3. Noise at the site has been measured and noise goals have been set in accordance with the requirements of the relevant statutory/regulatory authorities including the NSW Environmental Protection Authority.

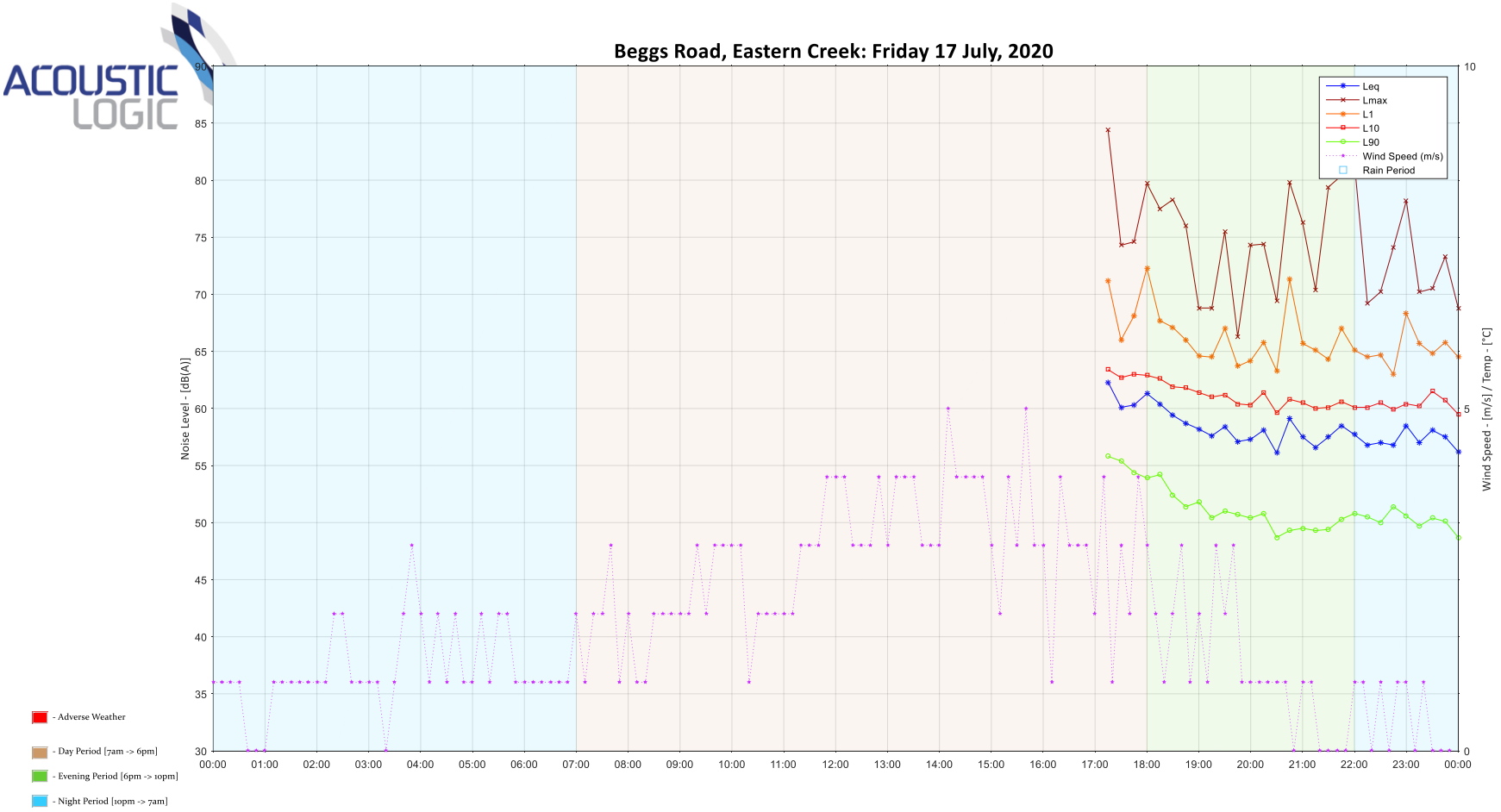
Based on the assessment detailed in this report the proposed development is able to achieve the relevant noise and vibration criteria.

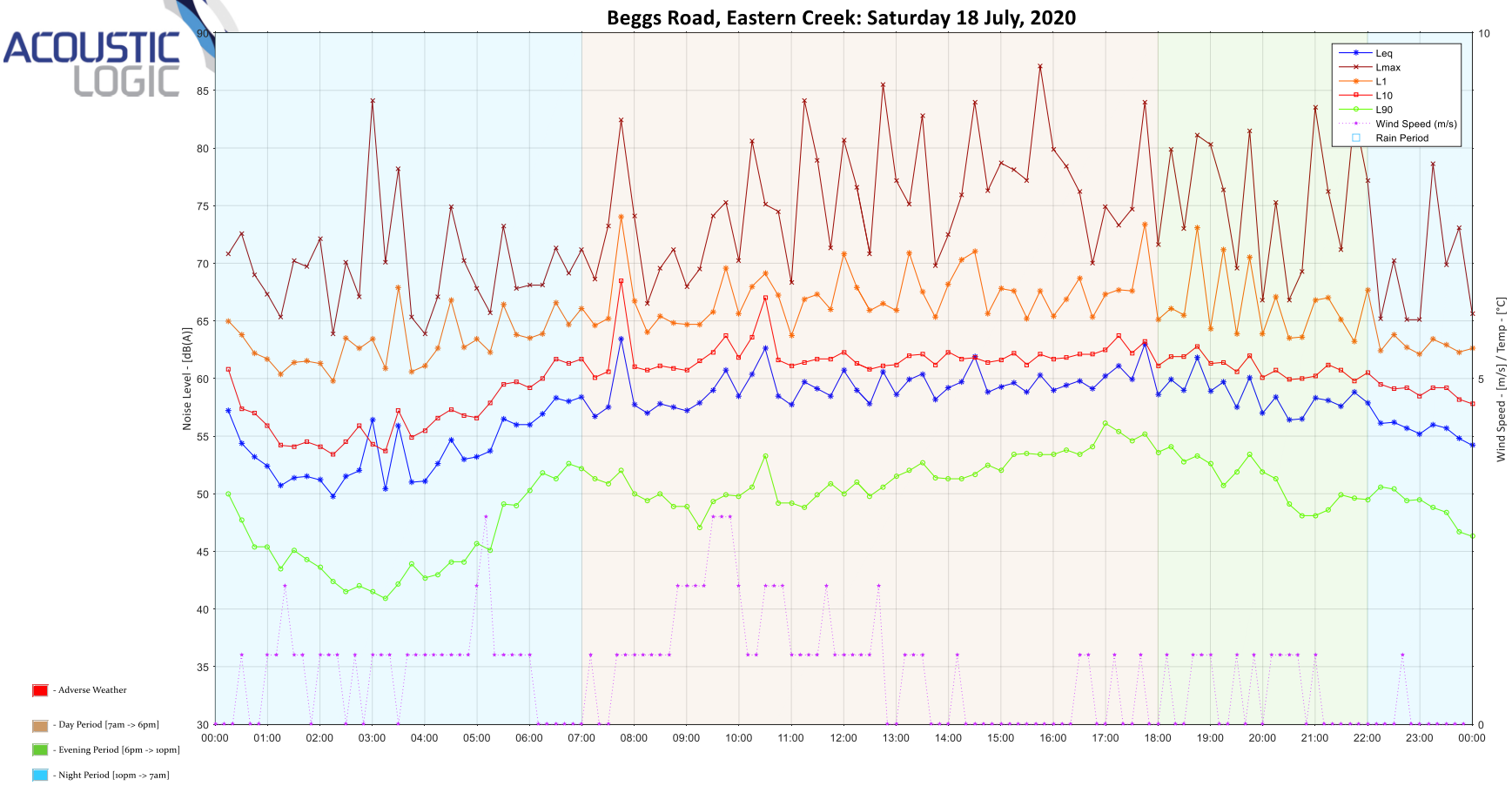
Please contact us should you have any further queries.

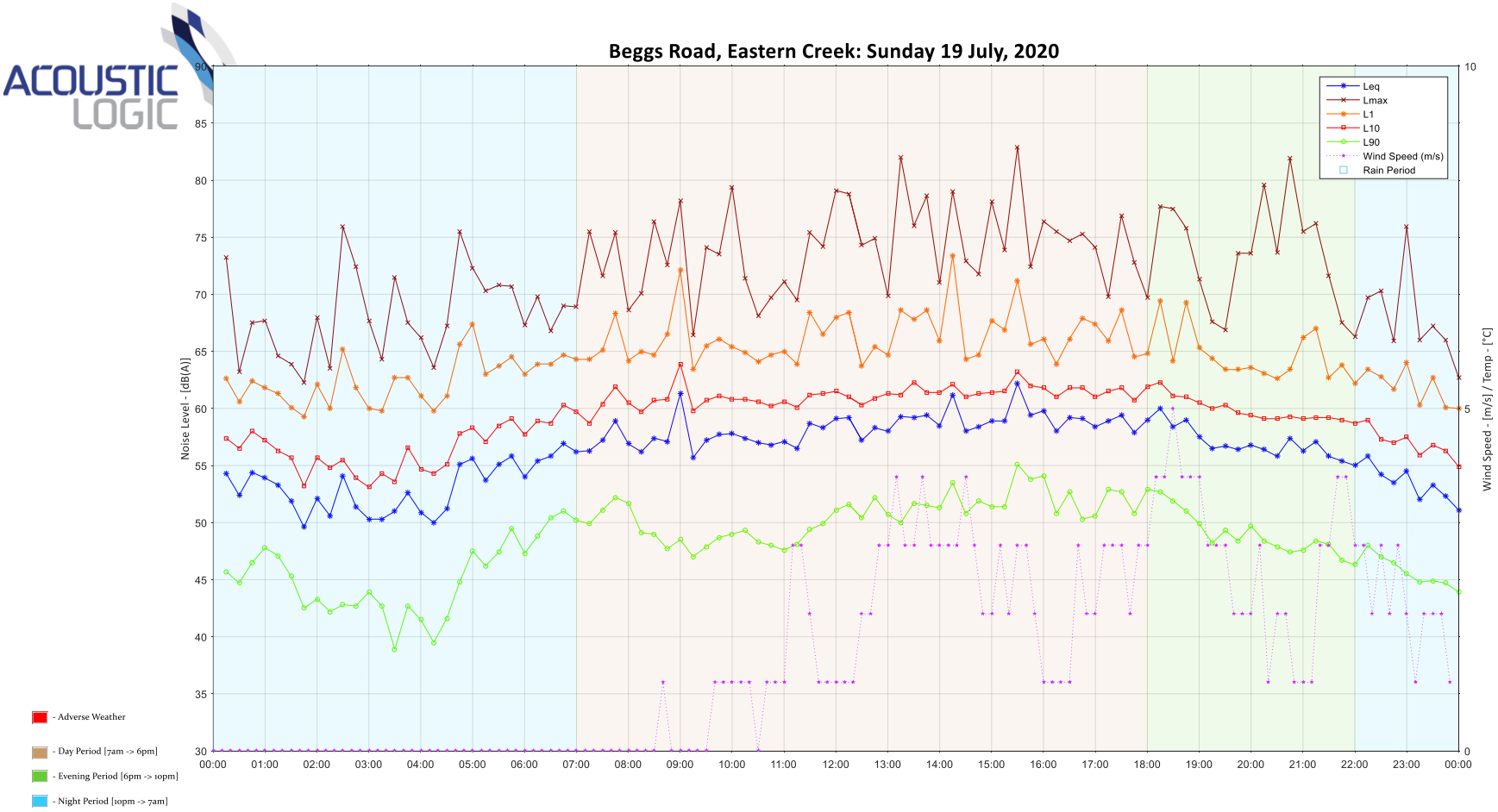
Yours faithfully,

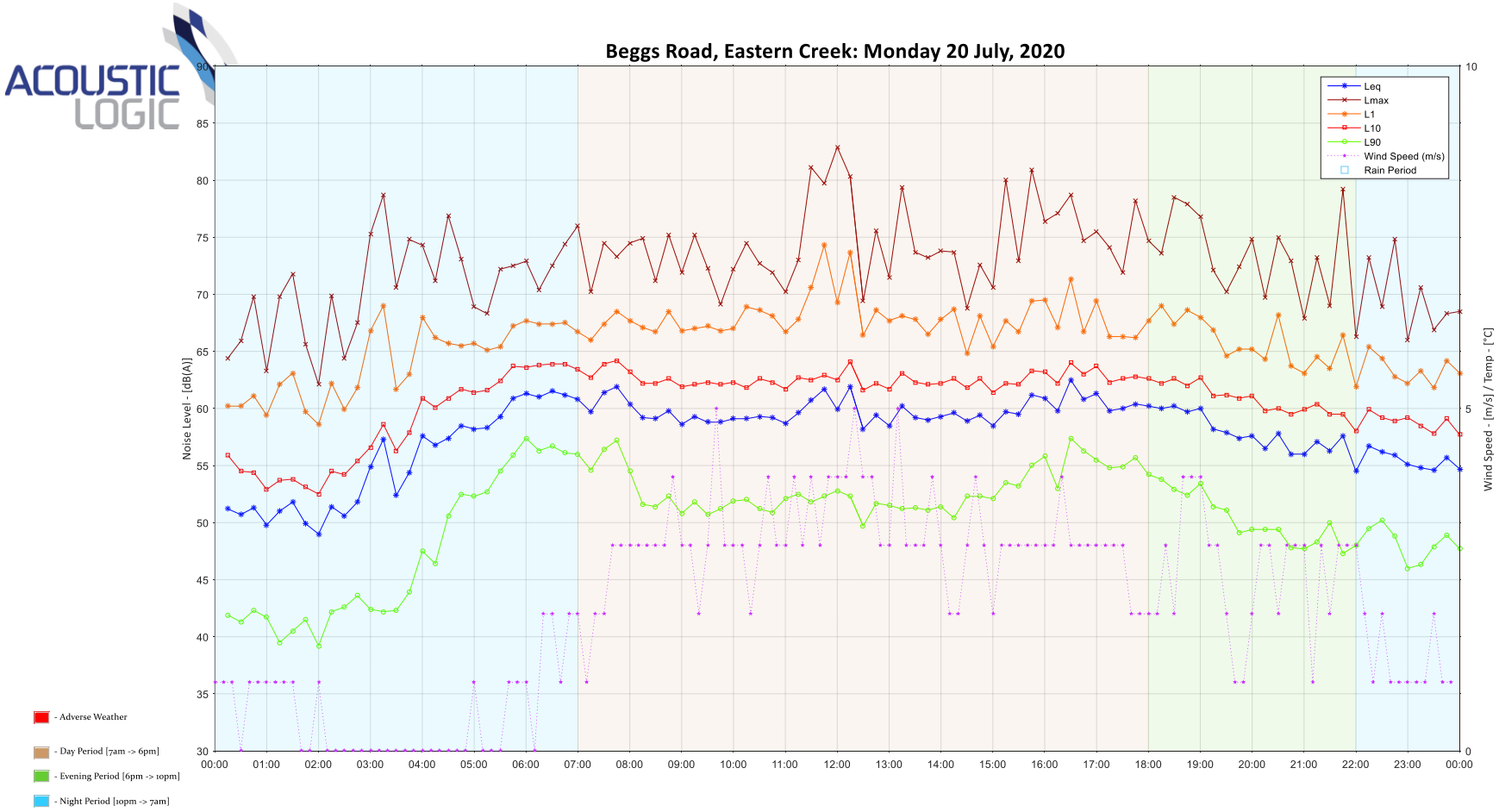
Acoustic Logic Pty Ltd
Alex Washer

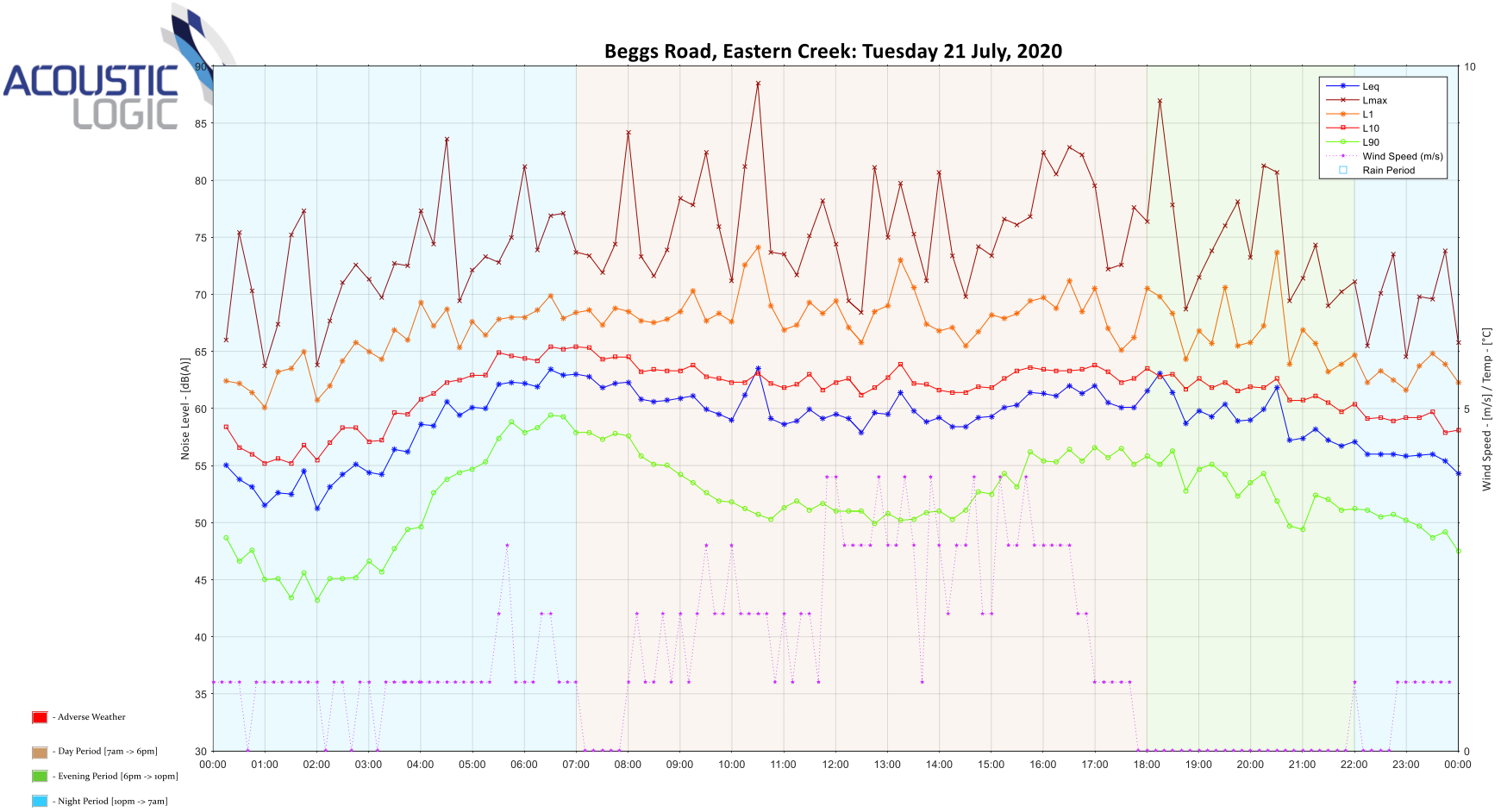
APPENDIX ONE – UNATTENDED NOISE MONITORING

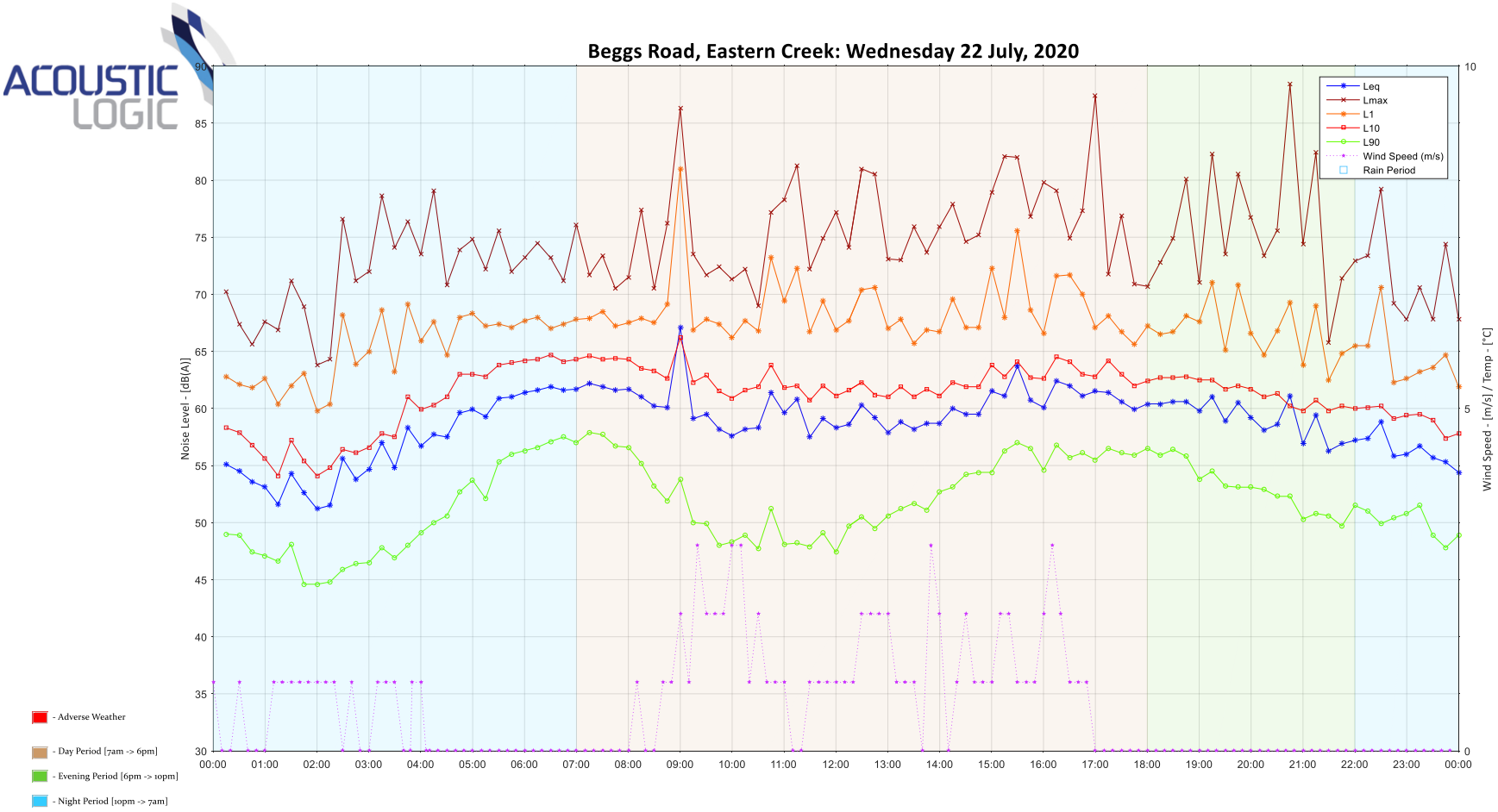

Beggs Road, Eastern Creek: Friday 17 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

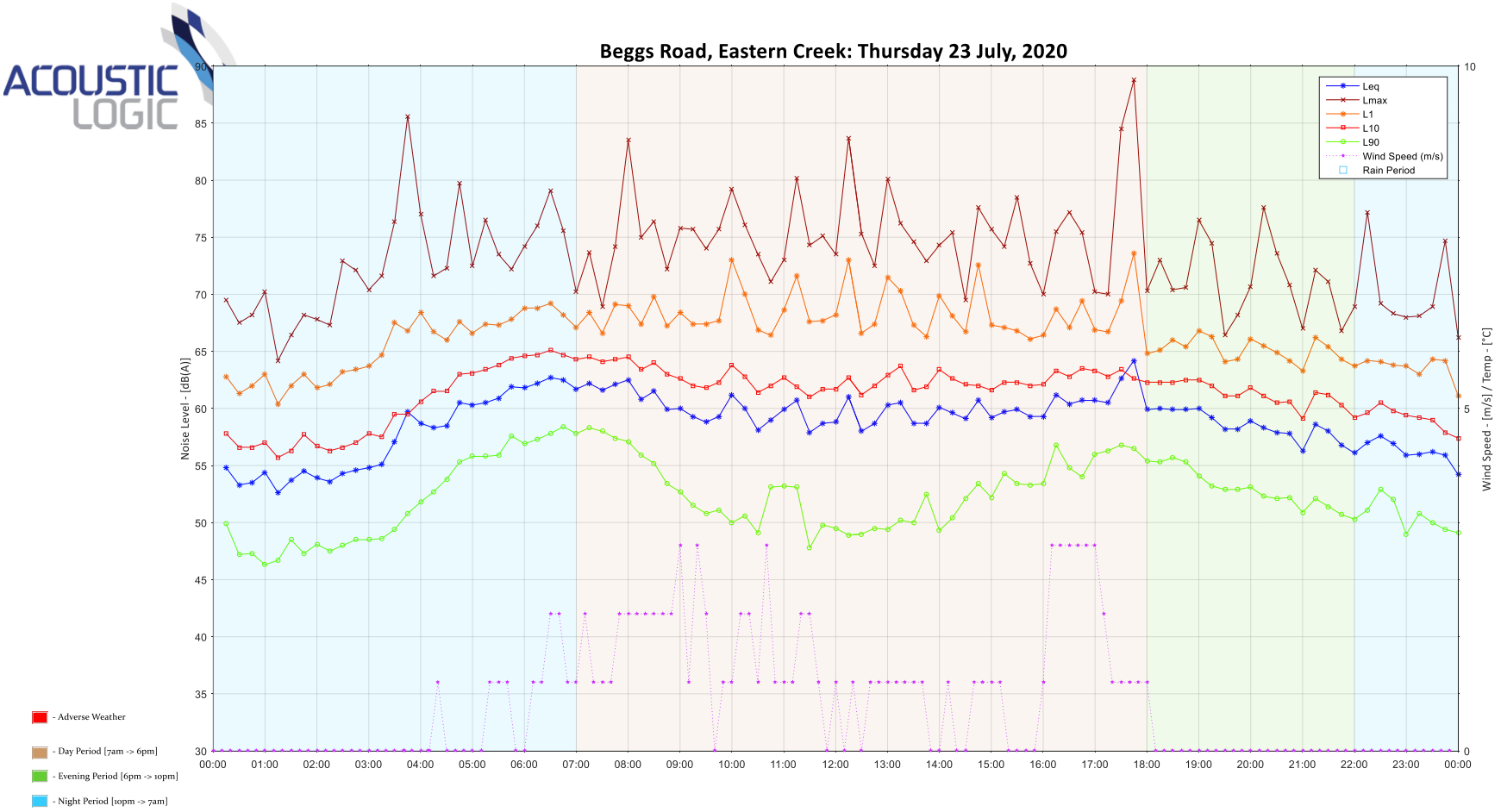

Beggs Road, Eastern Creek: Saturday 18 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

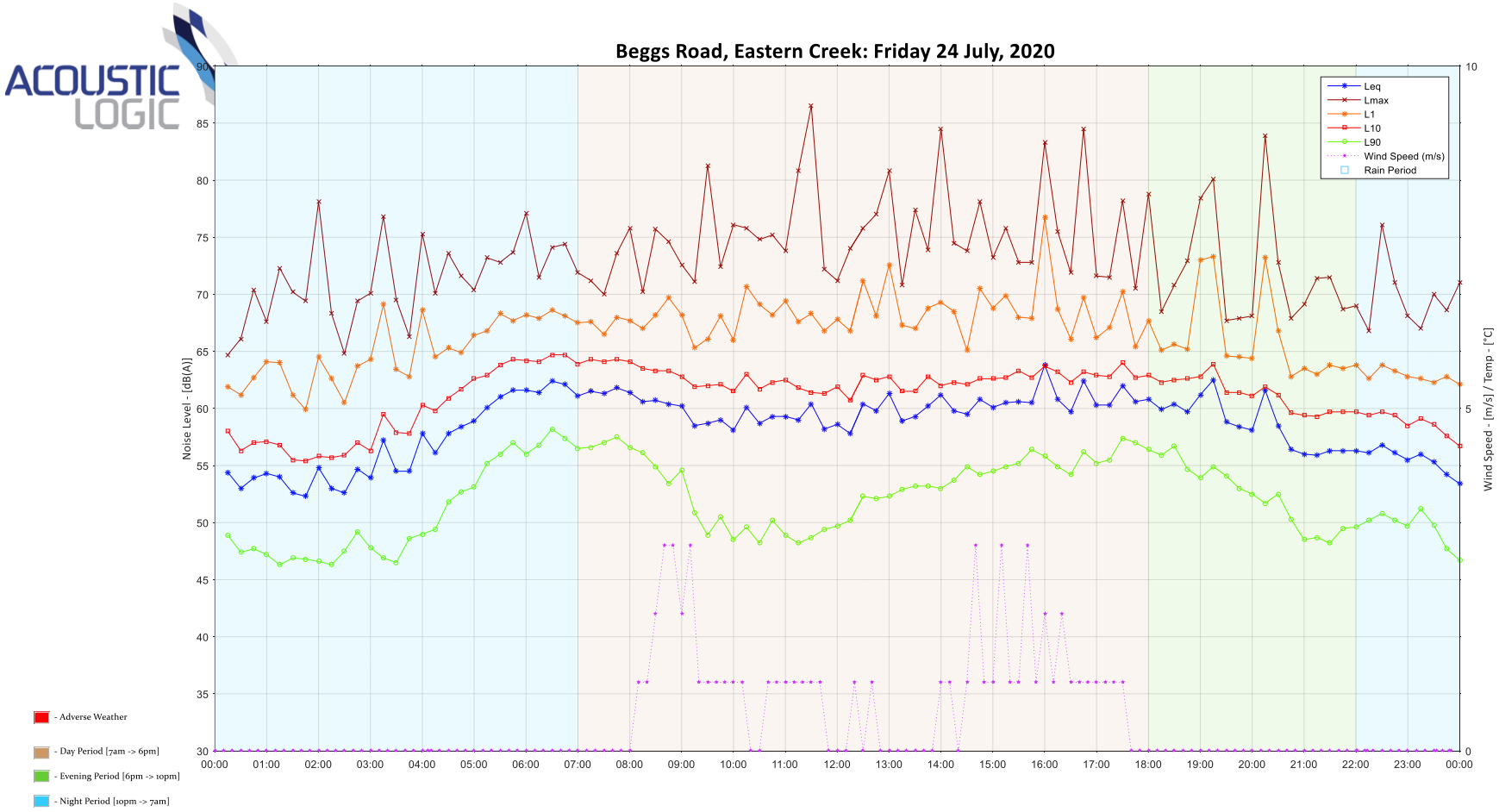

Beggs Road, Eastern Creek: Sunday 19 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

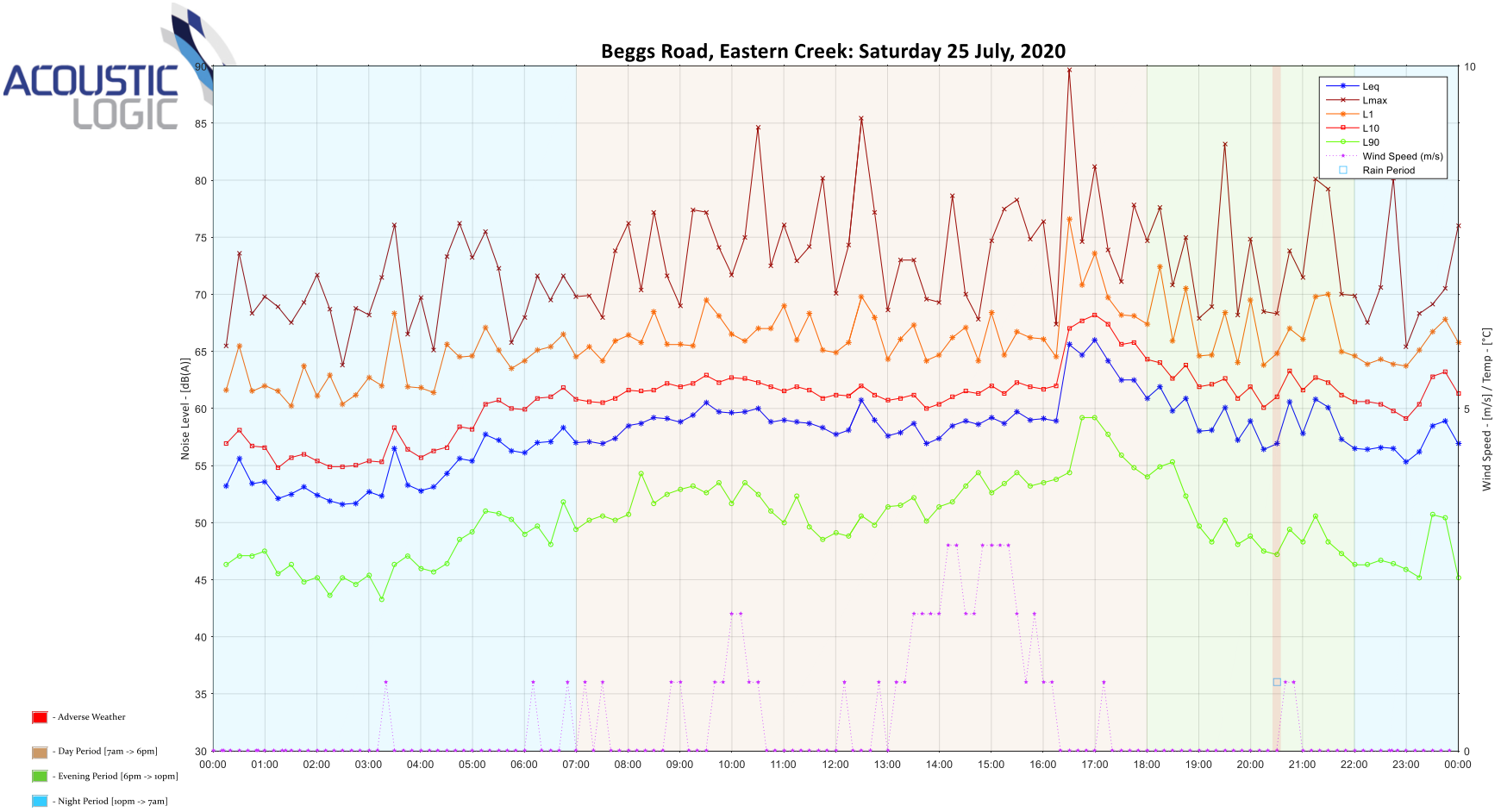

Beggs Road, Eastern Creek: Monday 20 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

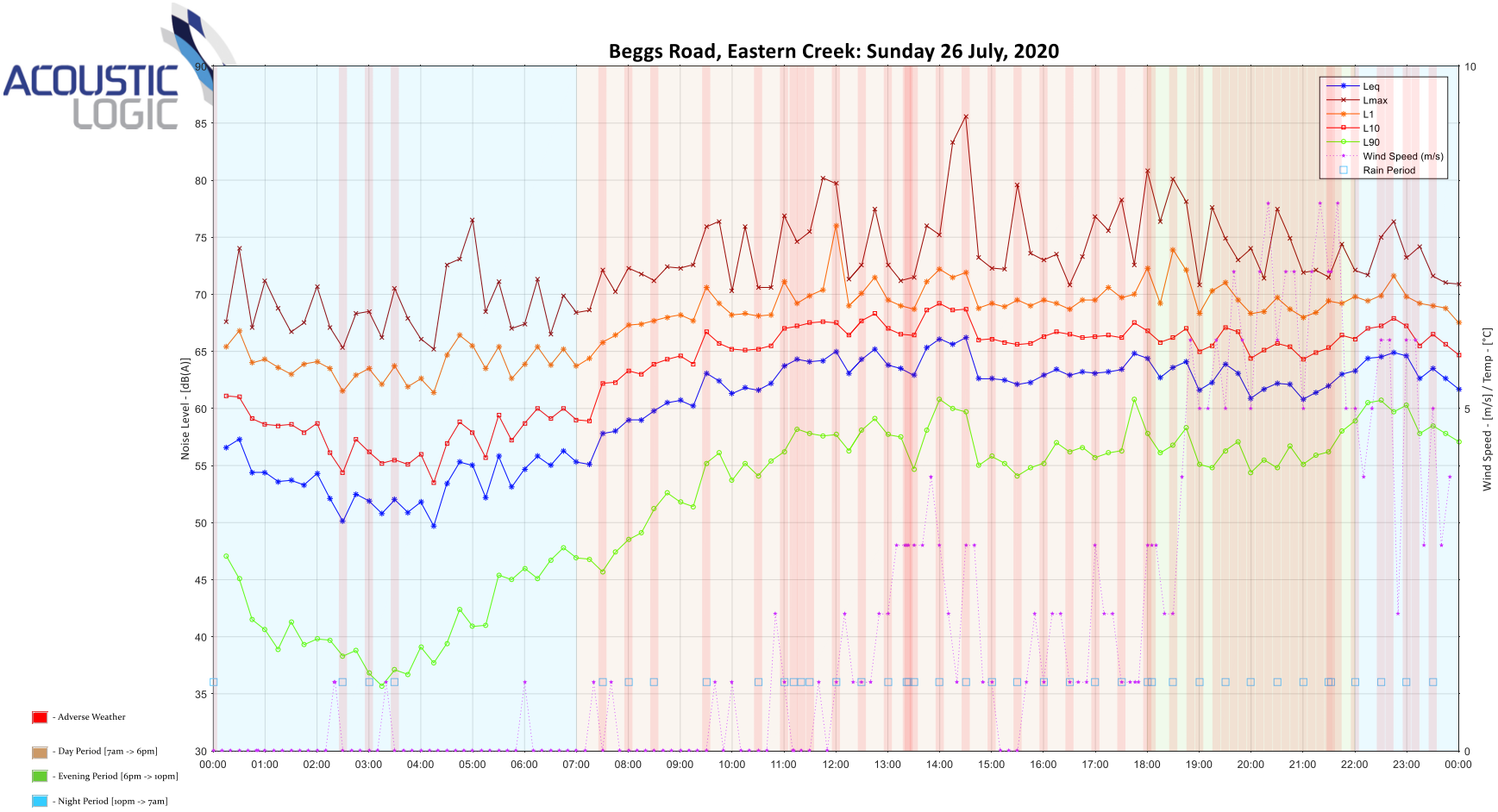

Beggs Road, Eastern Creek: Tuesday 21 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

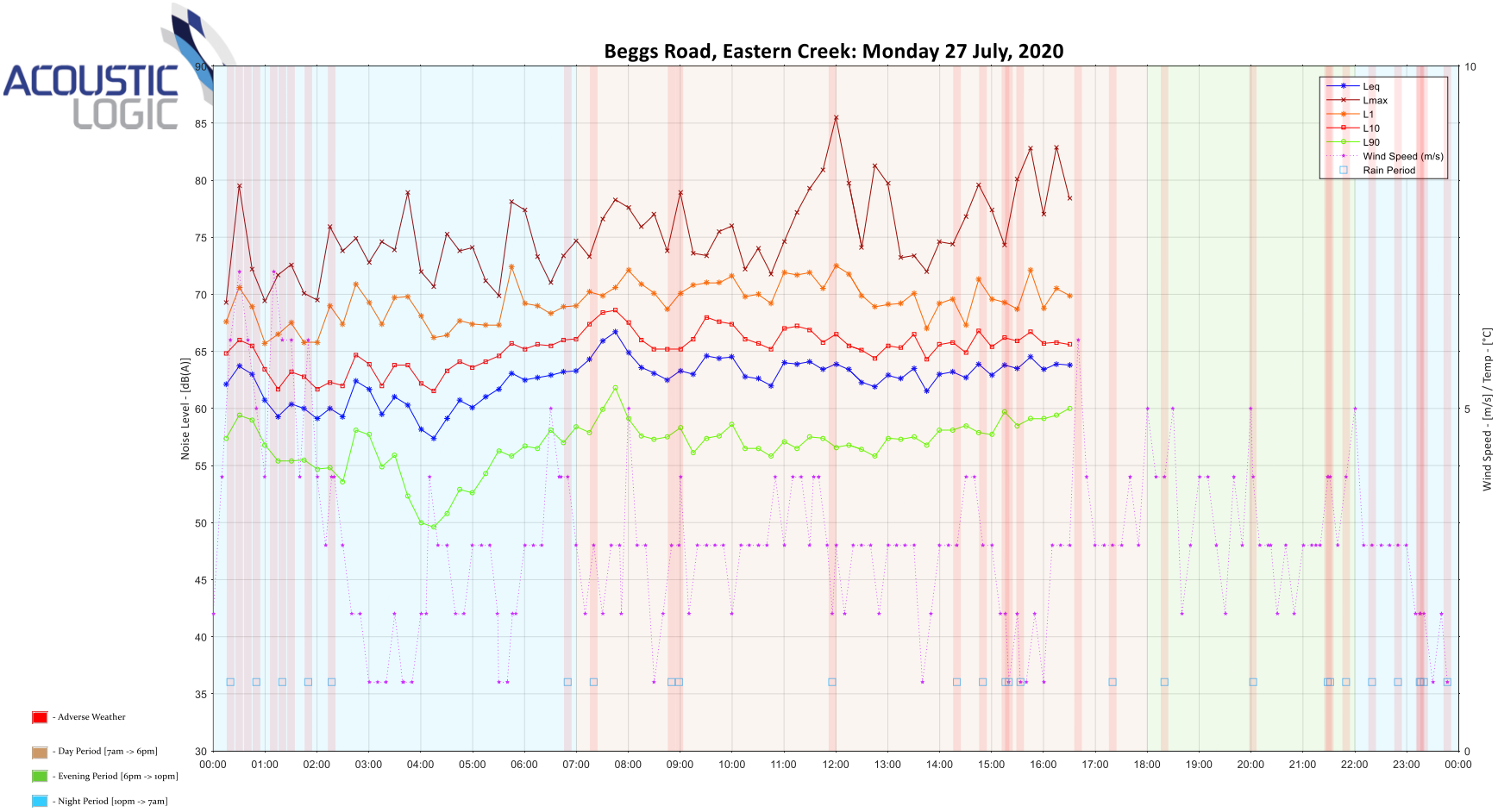

Beggs Road, Eastern Creek: Wednesday 22 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Beggs Road, Eastern Creek: Thursday 23 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Beggs Road, Eastern Creek: Friday 24 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Beggs Road, Eastern Creek: Saturday 25 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Beggs Road, Eastern Creek: Sunday 26 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Beggs Road, Eastern Creek: Monday 27 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]